Spot Safety Project Evaluation

Project Log # 200704327

Spot Safety Project # 12-01-215

Spot Safety Project Evaluation of the Traffic Signal Installation
At the Intersection of US 29/74 (Kings Mountain Highway) and
SR 1125 (Sparrow Springs Road)
Gaston County

Documents Prepared By:

Safety Evaluation Group
Traffic Safety Systems Management Section
Traffic Engineering and Safety Systems Branch
North Carolina Department of Transportation

Principal Investigator

_____ 3-10-2008
Jason B. Schronce Date

Traffic Safety Project Engineer

Spot Safety Project Evaluation Documentation

Subject Location

Evaluation of Spot Safety Project Number 12-01-215 – The Intersection of US 29/74 (Kings Mountain Highway) and SR 1125 (Sparrow Springs Road) in the City of Gastonia, Gaston County.

Project Information and Background from the Project File Folder

The spot safety project improvement countermeasure chosen for the subject location was the installation of a 5-phase actuated traffic signal. US 29/74 is a four lane divided roadway with a westbound left turn lane and a speed limit of 55 mph at this tee intersection. SR 1125 is a two lane roadway with a 35 mph posted speed limit. There are also two frontage roads located immediately south of the intersection that run parallel to US 29/74.

The original statement of problem was the development of a significant angle crash pattern and side street delay. The intersection met signal warrants 1B, 2, 3B, and 7B.

The initial crash analysis was completed from November 1, 1997 to October 31, 2000 with nineteen (19) reported crashes, ten (10) of which were deemed correctable. The final completion date for the improvement at the subject intersection was on March 27, 2002 with a total cost of $40,000.00.

Naive Before and After Analysis

After reviewing the spot safety project file folder along with all the crashes at the subject location, the crash data omitted from this analysis to consider for an adequate construction period was from January 1, 2002 to June 30, 2002. The before period consisted of reported crashes from June 1, 1997 through December 31, 2001 (4 years and 7 months) and the after period consisted of reported crashes from July 1, 2002 through January 31, 2007 (4 years and 7 months). The ending date for this analysis was determined by the date of available crash data at the time of analysis.

The treatment data consisted of all crashes within 150 feet of the subject intersection. *Please see attached location map and photos for further details.*

The following data table depicts the Naive Before and After Analysis for the treatment location. Please note that Frontal Impact Crashes were the target crashes for the applied countermeasure. The Frontal Impact Crash types considered are as follows: Left turn, same roadway; Left turn, different roadways; Right turn, same roadway; Right turn, different roadways; Head on; and Angle.

Treatment Information			
	Before	**After**	**Percent Reduction (-) Percent Increase (+)**
Total crashes	25	14	- 44.00 %
Total Severity Index	16.38	5.76	- 64.84 %
Target Crashes	14	7	- 50.00 %
Target Crash Severity Index	9.59	8.40	- 12.41 %
Volume	18,300	15,900	- 13.11 %
Injury Crash Summary – Total			
Fatal injury Crashes	1	0	- 100.00 %
Class A injury Crashes	3	0	- 100.00 %
Class B injury Crashes	5	4	- 20.00 %
Class C Injury Crashes	6	5	- 16.67 %
Total Injury Crashes	15	9	- 40.00 %

The naive before and after analysis at the treatment location resulted in a 44 percent decrease in Total Crashes, a 50 percent decrease in Target Crashes, and a 65 percent decrease in the Total Severity Index. The before period ADT year was 1999 and the after period ADT year was 2004.

Results and Discussion

The naive before and after analysis involving the comparison of treatment actual before data versus treatment actual after data resulted in a 44 percent decrease in Total Crashes and a 50 percent decrease in Target Crashes. The summary results above demonstrate that both Total Crashes and Target Crashes appear to have decreased at the treatment location from the before to the after period.

Referencing the *Collision Diagram*, a large portion of crashes at the intersection in the before period (13 of 25) were the result of a vehicles improperly crossing the eastbound lanes of US 29/74. After the signal installation, this angle pattern was reduced by nearly half.

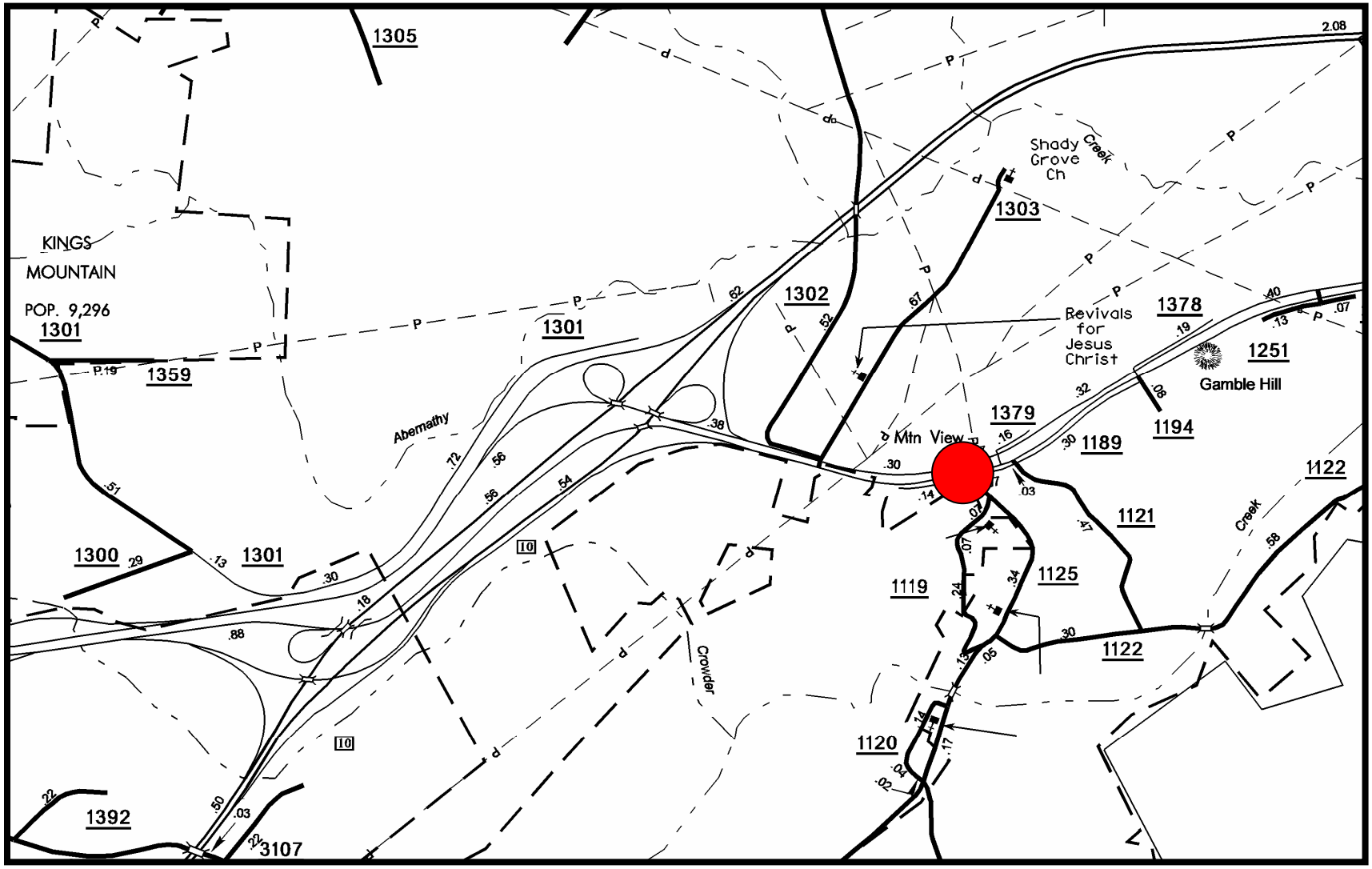
Approaching the intersection from the westbound US 29/74 turn lane, an advanced signal head is placed for the through movement in an awkward location (refer to photo). This signal head can be emitting a green ball when the turn lane actually is protected with a red arrow. During the short field investigation, we observed at least one vehicle that had to back up past the westbound left turn stop bar after realizing that the green ball signal did not apply to him. In addition, target crashes 5 and 6 of the after period represent this crash pattern.

The calculated benefit to cost ratio for this project is 48.35 considering total crashes. The benefit to cost ratio considering only target crashes is 11.98. The benefits are calculated using the change in annual crash costs from the before to the after period. Operational and other benefits related to the project are not considered in this analysis. The costs of the project include the actual construction costs as well as the increase in annual maintenance and utility costs.

Please see the attached *Treatment Site Photos*. Photos are provided for all approaches to the treatment intersection, including the two frontal road approaches.

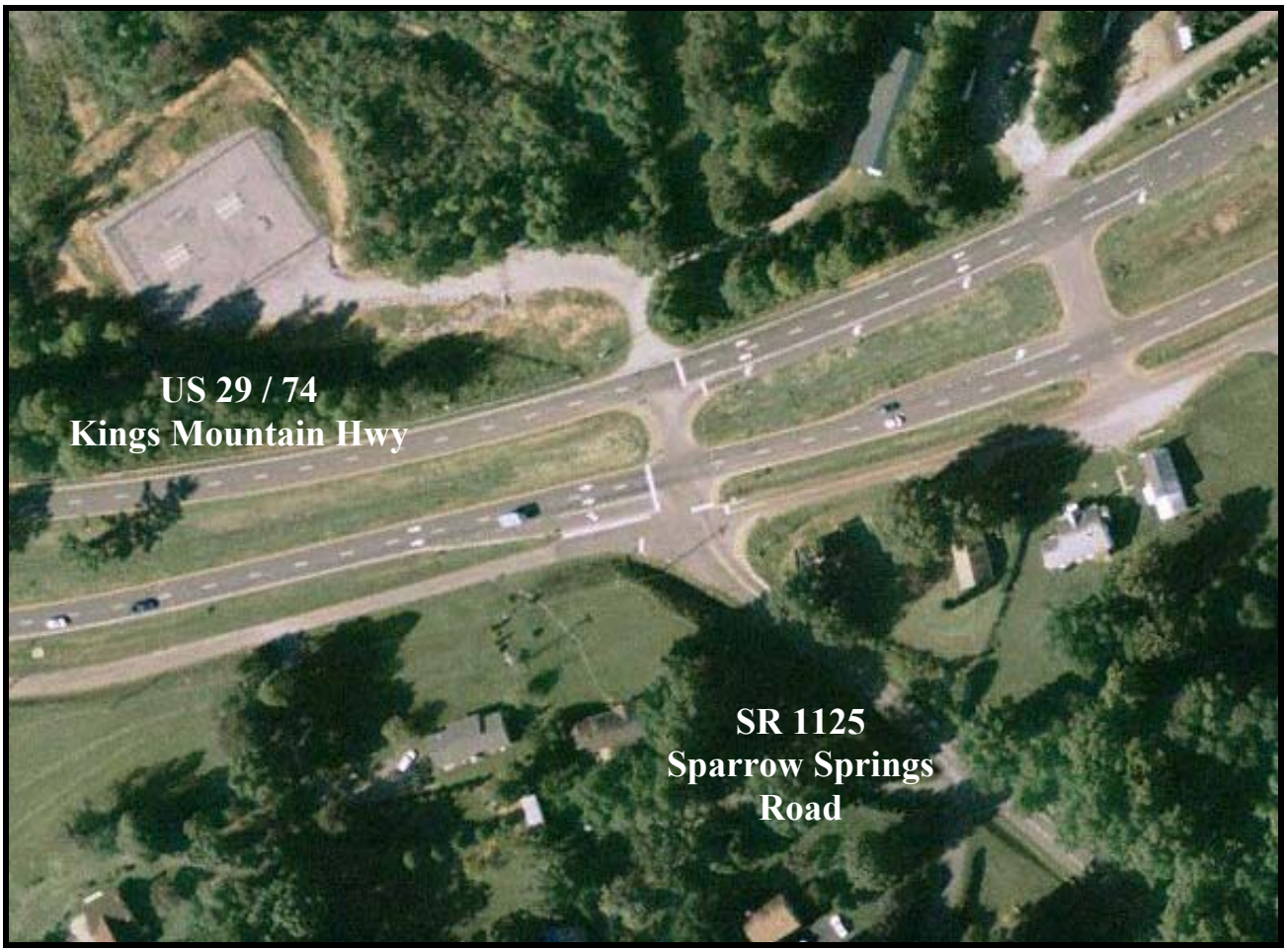
As the Safety Evaluation Group completes additional spot safety reviews for this type of countermeasure, we will be able to provide objective and definite information regarding actual crash reduction factors for this type of intersection.

Location Map
Gaston County
Evaluation of Spot Safety Project # 12-01-215



Location: US 29/74 (Kings Mountain Hwy) at SR 1125 (Sparrow Springs Road)

SS# 12-01-215 Aerial Map



TREATMENT SITE PHOTOS TAKEN 1/24/2008

Traveling East on US 29/74 (Kings Mountain Hwy)
Dual Posted Signal Ahead

Traveling East on US 29/74 (Kings Mountain Hwy)

Traveling North on SR 1125 (Sparrow Springs Rd)

Traveling North on SR 1125 (Sparrow Springs Rd)

Traveling West on US 29/74 – Signal Confusion

Traveling West on US 29/74

Traveling East on SR 1189 (C.V. Alexander Rd)

Traveling West on SR 1189 (C.V. Alexander Rd)

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 29/74 at SR 1125 | BY: JBS
COUNTY: Gaston | DATE: 3/5/2008
FILE NO.: SS 12-01-215 | NOTES: Total Crashes

DETAILED COST: TYPE IMPROVEMENT - New Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$40,000	10	0.149	$5,961
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$40,000	10	0.149	$5,961

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,400
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $9,261
TOTAL COST OF PROJECT= $40,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.59	4	0.87	11	2.40	10	2.18	$487,364
AFTER	4.59	0	0.00	9	1.96	5	1.09	$39,542

Annual Benefits from Crash Cost Savings $447,821

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $438,560

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 48.35

TOTAL COST OF PROJECT - $40,000 **COMPREHENSIVE B/C RATIO - 48.35**

BENEFIT-COST ANALYSIS WORKSHEET

LOCATION: US 29/74 at SR 1125 | BY: JBS
COUNTY: Gaston | DATE: 3/5/2008
FILE NO.: SS 12-01-215 | NOTES: Target Crashes

DETAILED COST: TYPE IMPROVEMENT - New Signal

ITEMS	TOTAL	SERVICE	CRF	ANNUAL COST
Construction	$40,000	10	0.149	$5,961
	$0	0	0.000	$0
Right-of-Way	$0	0	0.000	$0
TOTALS	$40,000	10	0.149	$5,961

ESTIMATED INCREASE IN ANNUAL MAINT. COST = $2,400
ESTIMATED INCREASE IN ANNUAL UTILITY COST = $900

TOTAL ANNUAL COST= $9,261
TOTAL COST OF PROJECT= $40,000

COMPREHENSIVE COST REDUCTION:

ESTIMATED NUMBER OF ANNUAL ACCIDENT DECREASES

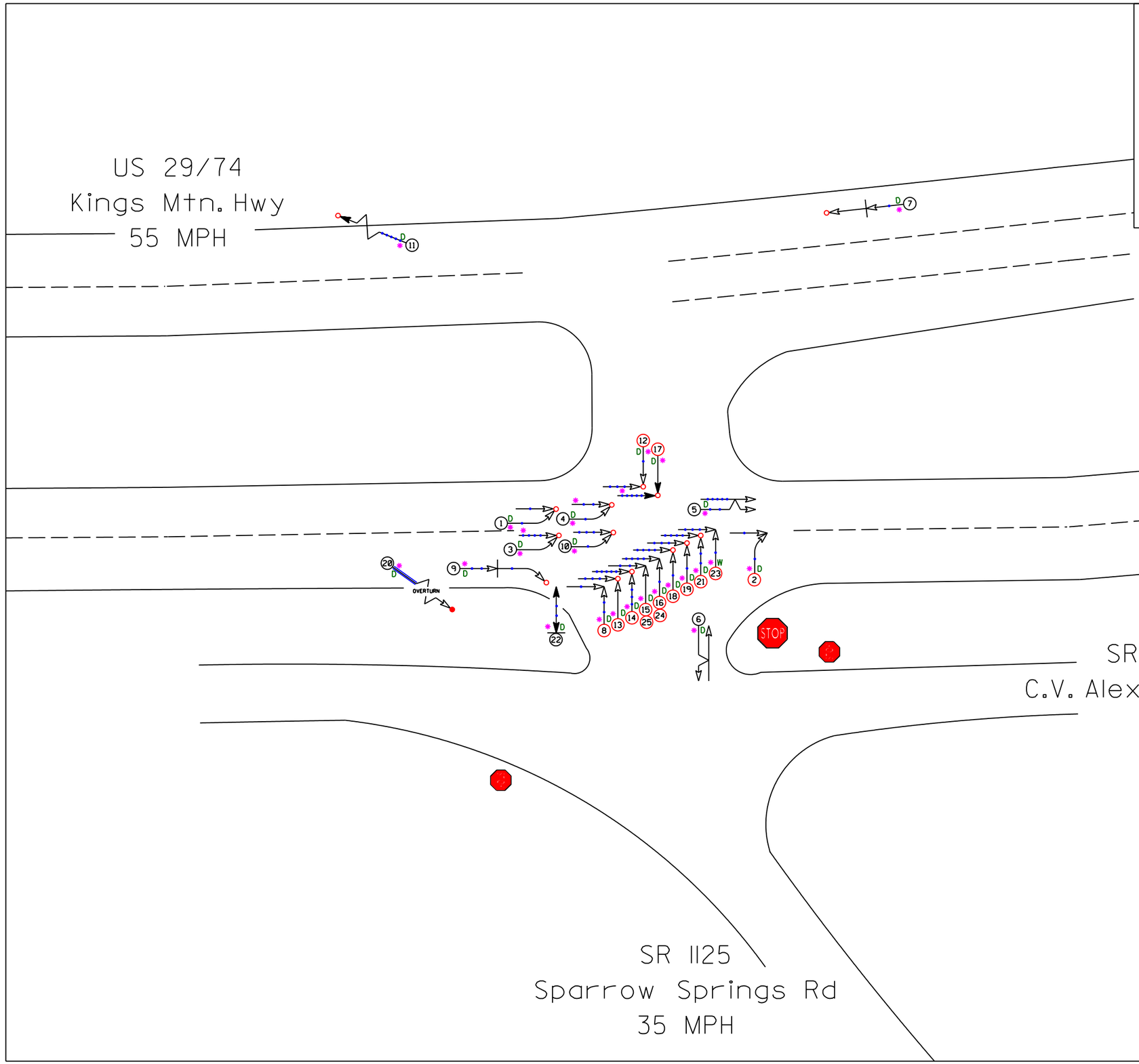
TIME PERIOD	YEARS	K & A CRASHES	K & A CRASHES PER YR	B & C CRASHES	B & C CRASHES PER YR	PDO CRASHES	PDO CRASHES PER YR	ANNUAL COSTS
BEFORE	4.59	1	0.22	6	1.31	7	1.53	$138,410
AFTER	4.59	0	0.00	7	1.53	0	0.00	$27,451

Annual Benefits from Crash Cost Savings $110,959

NET AVG. ANNUAL BENEFITS = AVG. ANNUAL BENEFITS - TOTAL ANNUAL COST = $101,697

BENEFIT-COST RATIO = AVG ANNUAL BENEFITS/TOTAL ANNUAL COST = 11.98

TOTAL COST OF PROJECT - $40,000 COMPREHENSIVE B/C RATIO - 11.98



LEGEND

MOVING VEHICLE
PEDESTRIAN
PARKED VEHICLE
PARKING VEHICLE
FIXED OBJECT
HEAD ON
REAR END
RAN OFF ROAD

ANGLE
TURNING
BACKING
SIDESWIPE
OUT OF CONTROL
INJURY
FATALITY

9 MPH OR LESS
10 MPH TO 19
20 MPH TO 29
30 MPH TO 39
40 MPH TO 49
50 MPH TO 59
60 MPH TO 69
70 AND UP
SPEED UNKNOWN

P PEDESTRIAN
T TRAIN
* DRIVER AT FAULT
D DRY
W WET
I ICY OR SNOWY
O OILY

SS# 12-01-215
Gaston County
Before Period
6/1/97 - 12/31/01
US 29/74 at SR 1125

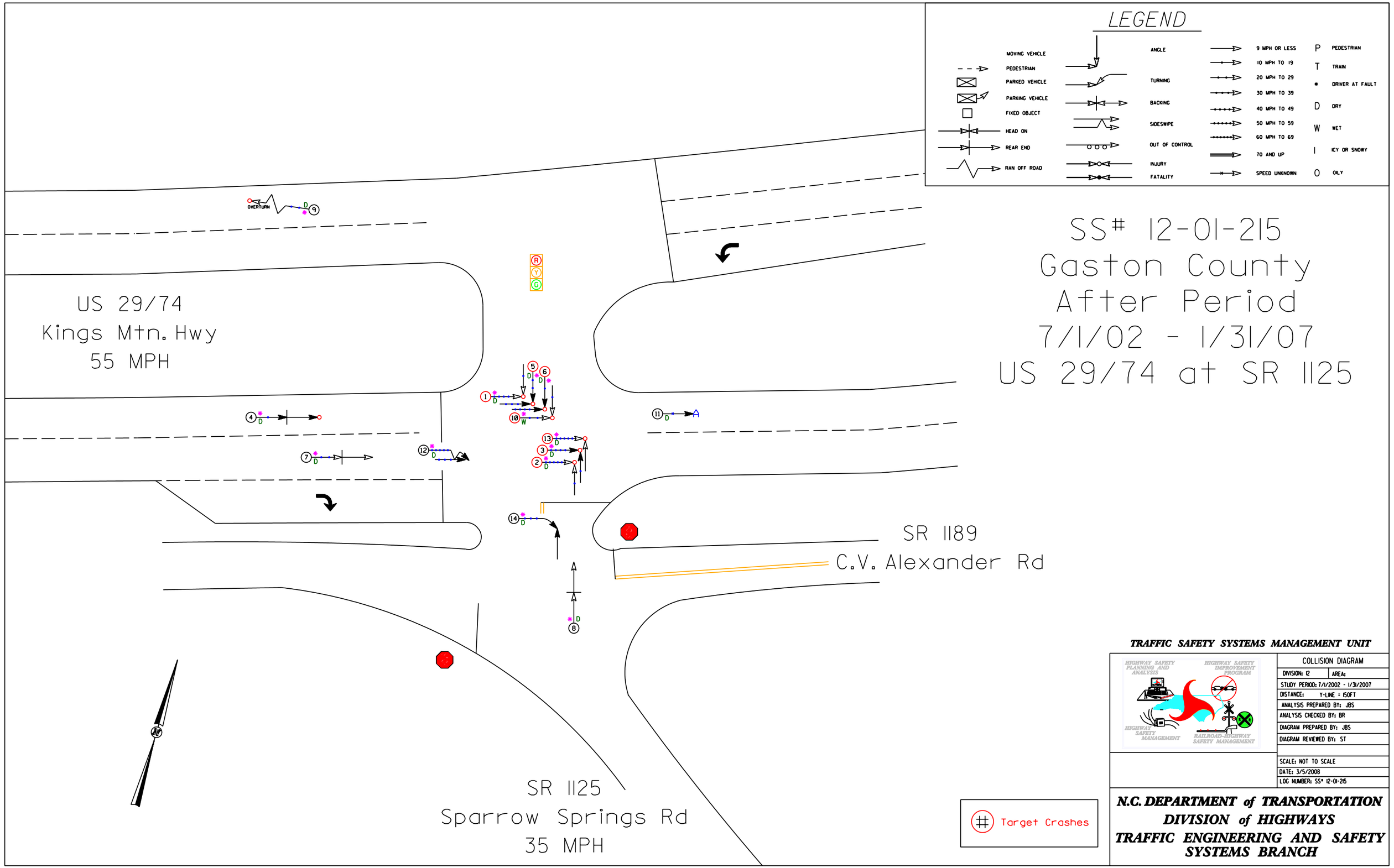
Target Crashes
Frontal Impact

TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT

HIGHWAY SAFETY PLANNING AND ANALYSIS
HIGHWAY SAFETY IMPROVEMENT PROGRAM
HIGHWAY SAFETY MANAGEMENT
RAILROAD-HIGHWAY SAFETY MANAGEMENT

COLLISION DIAGRAM	
DIVISION: 12	AREA:
STUDY PERIOD: 6/1/1997 TO 12/31/2001	
DISTANCE: Y-LINE = 150FT	
ANALYSIS PREPARED BY: JBS	
ANALYSIS CHECKED BY: BR	
DIAGRAM PREPARED BY: JBS	
DIAGRAM REVIEWED BY: ST	
SCALE: NOT TO SCALE	
DATE: 3/5/2008	
LOG NUMBER: SS# 12-01-215	

N.C. DEPARTMENT of TRANSPORTATION
DIVISION of HIGHWAYS
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH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* DRIVER AT FAULT
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I ICY OR SNOWY
O OILY
SS# 12-01-215
Gaston County
After Period
7/1/02 - 1/31/07
US 29/74 at SR 1125
US 29/74
Kings Mtn. Hwy
55 MPH
SR 1189
C.V. Alexander Rd
SR 1125
Sparrow Springs Rd
35 MPH
OVERTURN
R
Y
G
Target Crashes
TRAFFIC SAFETY SYSTEMS MANAGEMENT UNIT
COLLISION DIAGRAM
DIVISION: 12
AREA:
STUDY PERIOD: 7/1/2002 - 1/31/2007
DISTANCE: Y-LINE = 150FT
ANALYSIS PREPARED BY: JBS
ANALYSIS CHECKED BY: BR
DIAGRAM PREPARED BY: JBS
DIAGRAM REVIEWED BY: ST
SCALE: NOT TO SCALE
DATE: 3/5/2008
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